

EXPRESS MAIL NO. EV 318 623 724 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Steven M. Blumenau et al.

Serial No.:

Filed:

**For: MAPPING OF HOSTS TO LOGICAL
STORAGE UNITS AND DATA
STORAGE PORTS IN A DATA
PROCESSING SYSTEM**

§ 87(2)(b)

Group Art Unit:

Examiner:

Att'y Docket: 10830.0034.CNUS02

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Please find enclosed a Form PTO-1449 citing Blumenau et al. U.S. Patent 6,421,711 issuing from the applicants' grandparent application Ser. 09/106,299, and the references cited in the applicants' parent application Ser. 10/139,490. Since applicants are relying on priority of the parent and grandparent applications, copies of the cited references should be available from the parent and grandparent file wrappers.

The declaration filed with the present application is from the grandparent application. Pages 3 to 103 of the present application are copies of pages 3 to 102 of the grandparent application in the applicants' file. Page 1 has been amended to change the title from "Virtual Ports for Partitioning of Data Storage" to -- Mapping Of Hosts To Logical Storage Units And

Data Storage Ports In A Data Processing System --. Pages 103 to 113 of the present application include new claims 1 to 47. Page 104 includes a new abstract based on the new claims. The drawings filed with the present application are copies of the formal drawings accepted in the grandparent application and appearing in the issued patent U.S. 6,421,711.

Support for the new claims is found in the grandparent application Ser. 09/106,299 (and in the present application) as follows:

Claim 1. A data processing system (FIG. 1), comprising:

- a plurality of hosts (FIG. 1, hosts 22-25);
- a plurality of data storage devices (FIG. 1, data storage devices 28-31); and
- an apparatus (FIG. 1, storage controller 27) for coupling the hosts to the data storage devices, the apparatus having host ports (FIG. 1, ports of port adapters 26, 27) connected to the hosts, wherein the data storage devices are configured into logical storage units (FIG. 1, storage volumes 26 distributed over one more storage devices 28, 29, 30, and 31, page 16 line 17 to page 17 line 3, page 30 line 22 to page 31 line 2), the apparatus is programmed with a mapping of the hosts to respective logical storage units (FIG. 5, FIG. 8, FIG. 25), and the apparatus is programmed (FIG. 11; FIGS. 27-28) to permit data access of a logical storage unit by the host to occur through a host port upon receipt at the host port of a request from the host for access to the logical storage unit when the request from the host for access to the logical storage unit is in conformance with the mapping (page 17 line 14 to page 18 line 3), and the apparatus is programmed to deny data access by the host through the host port upon receipt at the host port of

a request from the host for data access that is not in conformance with the mapping (page 30, lines 8-11; page 39 line 16 to page 41 line 16; page 62 line 7 to page 66 line 8).

Claim 2. The data processing system as claimed in claim 1, wherein the apparatus is programmed to respond to receipt at the host port of the request from the host for access to the logical storage unit by decoding a host identifier (FIG. 11, step 110, SID; FIG. 28, step 330, SID) and a logical storage unit specification from the request for access to the logical storage unit (FIG. 11, step 108, volume to access; FIG. 28, step 334, LUN to access), and determining whether or not the host identifier and the logical storage unit specification decoded from the request for access to the logical storage unit are in conformance with the mapping (FIG. 11, steps 103 and 108; FIG. 28, steps 330 and 335), and when the host identifier and the logical storage unit specification decoded from the request for access to the logical storage unit are in conformance with the mapping, permitting data access of the logical storage unit to occur at the host port in response to the request for access to the logical storage unit (FIG. 11, step 111; FIG. 28, step 338).

Claim 3. The data processing system as claimed in claim 1, wherein the mapping prohibits each host from accessing all of the logical storage units (FIG. 9, private/shared flag; private volumes are assigned to each host for storage of private data, page 28, lines 3-7; page 32, lines 4-6; FIG. 14, page 43 line 22 to page 44 line 2).

Claim 4. The data processing system as claimed in claim 1, wherein the mapping includes a respective mapping for each host of logical unit numbers of storage to data storage volumes configured from the data storage devices (FIG. 25, LUN to logical volume map for each host index in the virtual port mapping table 282; page 59 lines 15-22; FIG. 30, page 67, line 15 to page 68, line 7).

Claim 5. The data processing system as claimed in claim 4, wherein the mapping restricts the data storage volumes that are visible to said each host (FIG. 11, report LUNs request by host, steps 106-107; page 28, lines 3-5 and 13-14; page 40, lines 9-12).

Claim 6. The data storage system as claimed in claim 4, wherein the apparatus is programmed to report to said each host the logical unit numbers of storage accessible to said each host (FIG. 11, report LUNs request by host, steps 106-107; page 28, lines 3-5 and 13-14; page 40, lines 9-12).

Claim 7. The data processing system as claimed in claim 1, wherein the apparatus includes a graphical user interface for permitting a user to program the mapping of the hosts to the respective logical storage units (FIG. 4, display 91, keyboard 92, system administrator 90, page 30, line 17 to page 31 line 2; FIG. 30, page 67, lines 6-9).

Claim 8. The data processing system as claimed in claim 1, wherein the apparatus includes a switch for routing the data storage access requests from the host ports to ports that provide

access to the data storage (FIG. 21, virtual switch 238, 239, virtual ports 240, 241, page 5, line 19 to page 6 line 2, page 54 line lines 1-6, page 54 line 20 to page 55 line 4, page 56 lines 2-3).

Claim 9. The data processing system as claimed in claim 8, wherein the apparatus is programmed with a mapping of the hosts to the ports that provide access to the data storage (FIGS. 23 and 24, virtual port host table 281, page 57 lines 12-14, page 58 lines 12-14).

Claim 10. The data processing system as claimed in claim 9, wherein the apparatus is programmed with a mapping of logical volumes of storage that are accessible from each of the ports that provide access to the data storage (FIGS. 23 and 25, virtual port mapping table 282, page 57, lines 14-16, page 59; lines 15-22).

Claim 11. The data processing system as claimed in claim 8, wherein one or more of the ports that provide access to the data storage are assigned to each host, a set of storage volumes are made accessible from each of the ports that provide access to the data storage, and the apparatus is programmed so that said each host can access storage at said each of the ports that provide access to the data storage only if said each of the ports that provide access to the data storage has been assigned to said each host (FIGS. 23 and 24, virtual port host table 281, virtual port mapping table 282, page 57 lines 12-16, page 58 lines 12-14, page 59, lines 15-22, page 122 lines 9-12).

Claim 12. The data processing system as claimed in claim 8, wherein the mapping includes a respective mapping for each host of logical unit numbers of storage to data storage volumes that are configured from the data storage devices and are accessible to said each host (FIG. 25, LUN to logical volume map for each host index in the virtual port mapping table 282; page 59 lines 15-22; FIG. 30, page 67, line 15 to page 68, line 7), and the apparatus is programmed to respond to a request directed to said each of the ports from said each host for a report of the logical unit numbers of storage that are accessible to said each host from said each of the ports that provide access to the data storage by providing a report of the logical unit numbers of storage that are accessible to said each host from said each of the ports that provide access to the data storage (FIGS. 27-28, report LUNS request from host to virtual port, steps 332 to 333, page 62 lines 7 to 19, page 64 line 21 to page 65 line 2).

Claim 13. The data processing system as claimed in claim 8, wherein the apparatus is programmed to provide different storage access characteristics for the ports that provide access to the data storage (e.g., FIG. 25, private/shared flag in the virtual port mapping table 282, page 28, lines 3-7; page 32, lines 4-6).

Claim 14. The data processing system as claimed in claim 8, wherein the apparatus is programmed with a respective private/shared flag for each port that provides access to the data storage for indicating whether or not said each port that provides access to the data storage provides access to data storage that is private to a respective one of the hosts (FIG. 25, private/shared flag in the virtual port mapping table 282, page 28, lines 3-7; page 32, lines 4-6).

Claim 15. The data processing system as claimed in claim 8, wherein the apparatus includes a graphical user interface for permitting a user to program the mapping of the hosts to the respective logical storage units, and the graphical user interface indicates which of the ports that provide access to the data storage are accessible to each host. (FIG. 4, display 91, keyboard 92, system administrator 90, page 30 line 17 to page 31 line 2, FIG. 30, page 67, lines 6-9).

Claim 16. The data processing system as claimed in claim 1, wherein the data storage devices include disk drives in a cached disk storage subsystem (FIG. 1, cached storage subsystem 20, cache memory 32, disk drive storage devices 28-31, page 16 line 17 to page 17 line 3).

Claim 17. The data processing system as claimed in claim 1, wherein the apparatus includes at least one fibre-channel switch providing the host ports, and wherein the hosts are connected to the fibre-channel switch by a fibre-channel data network. (FIG. 21, virtual switch 238, 239, fibre-channel loops 42 and 43, page 54 line 14 to page 55 line 21.)

Claim 18. The data processing system as claimed in claim 1, wherein the apparatus includes a first switch coupling the hosts to the data storage devices and a second switch coupling the hosts to the data storage devices, wherein each switch has a host port coupled to each host (FIG. 22, virtual switch 266 having host ports 262 and 263 coupled to the hosts 251-254 and virtual

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switch 267 having host ports 264 and 265 coupled to the hosts 251-254, page 56 line 14 to page 57 line 8).

Claim 19. The data processing system as claimed in claim 18, wherein the apparatus includes a controller for each switch, wherein each controller is programmed with the mapping of the hosts to the respective logical storage units (FIG. 21, microprocessor 235, FIG. 22, volume access and mapping information 269 and 270, page 54 line 19 to page 55 line 4, page 57, lines 3-8).

Claim 20. See the support for claims 1, 2 and 8 above.

Claim 21. See the support for claim 3 above.

Claim 22. See the support for claim 4 above.

Claim 23. See the support for claim 5 above.

Claim 24. See the support for claim 6 above.

Claim 25. See the support for claims 9 and 10 above.

Claim 26. See the support for claim 11 above.

Claim 27. See the support for claim 12 above.

Claim 28. See the support for claim 13 above.

Claim 29. See the support for claim 14 above.

Claim 30. See the support for claim 15 above.

Claim 31. See the support for claim 16 above.

Claim 32. See the support for claim 17 above.

- Claim 33. See the support for claim 1 above.
- Claim 34. See the support for claim 2 above.
- Claim 35. See the support for claim 3 above.
- Claim 36. See the support for claim 4 above.
- Claim 37. See the support for claim 5 above.
- Claim 38. See the support for claim 6 above.
- Claim 39. See the support for claim 7 above.
- Claim 40. See the support for claim 8 above.
- Claim 41. See the support for claim 9 above.
- Claim 42. See the support for claim 10 above.
- Claim 43. See the support for claim 11 above.
- Claim 44. See the support for claim 12 above.
- Claim 45. See the support for claim 13 above.
- Claim 46. See the support for claim 14 above.
- Claim 47. See the support for claim 15 above.

Steven M. Blumenau et al.

Sept 5, 2003
Date

Howrey Simon Arnold & White, LLP
750 Bering Drive
Houston, TX 77057-2198
(713) 787-1400

Respectfully submitted,



Richard C. Auchterlonie
Reg. No. 30,607
Customer No. 27927
ATTORNEY FOR ASSIGNEE,
EMC CORPORATION
(713) 787-1698

Form PTO-1449 (modified) List of Patents and Publications for Applicant's INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary)	Atty. Docket No. 10830.0034.CNUS02	Serial No.
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Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
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	A2	6,145,028	11/2000	Shank et al.	710	31	12/11/1997
	A3	5,568,629	10/1996	Gentry et al.	395	441	11/04/1993
	A4	5,440,716	8/1995	Schultz	395	441	10/28/1993
	A5	6,263,445	07/17/2001	Blumenau	713	201	06/30/1998
	A6	6,173,306	01/09/2001	Raz et al.	709	102	07/21/1995
	A7	5,974,453	10/26/1999	Andersen et al.	709	220	10/08/1997
	A8	6,295,575	09/2001	Blumenau et al.	711	5	06/29/1998
	A9	6,278,705	08/2001	Chau et al.	370	352	04/08/1997
	A10	6,260,120	07/2001	Blumenau et al.	711	152	06/29/1998
	A11	6,209,023	03/27/2001	Dimitroff et al.	709	211	01/05/1999
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	A15	6,161,104	12/12/2000	Stakutis et al.	707	10	05/11/1999
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	A20	6,085,234	07/04/2000	Pitts et al.	709	217	07/23/1998
	A21	6,044,442	03/2000	Jesionowski	711	153	11/21/1997
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	A27	5,959,968	09/1999	Chin et al.	370	216	06/30/1997
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	A30	5,940,612	08/1999	Brady et al.	709	103	
	A31	5,935,205	08/10/99	Murayama et al.	709	216	06/21/96
	A32	5,930,827	07/27/99	Sturges	711	170	12/02/96
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	A43	5,860,137	01/12/99	Raz et al.	711	202	07/21/95
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	C3	Networking Group, Internet-Draft, Paul J. Leach, Dilip C. Naik, "A Common Internet File System (CIFS/1.0) Protocol", December 19, 1997, pp. 1-121
	C4	Fibre Channel Overview, Zoltán Meggyesi, KFKI - RMKI, Research Institute for Particle and Nuclear Physics, December 9, 1997; pp 1-10, http://www1.cern.ch/HSI/fcs/spec/overview.htm
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	C6	TINA, "A Common Software Architecture for Multimedia and Information Services" Emmanuel Darmois, Motoo Hoshi, August 9, 1997, pp. 1-6. http://www.tinac.com/about/nutshell.htm
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	C10	IEEE/IEE Electronic Library, "Scheduling of Storage and Cache Servers For Replicated Multimedia Data" Park Kyeongho; Yanghee Choi; Chong Sang Kim, Dept. of Comput. Eng., Seoul Nat. Univ., South Korea; High Performance Computing on the Information Superhighway, 1997 HPC Asia '97, 18 April - 1 May, 1997, pp. 484-487.

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Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

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	C20	IEEE/IEE Electronic Library, "Multimedia Storage Servers: A Tutorial" Gemmell, D.J.; Vin, H.M.; Kandlur, D.D.; Venkat Rangan, P.; Rowe, L.A.; Simon Fraser Univ., Burnaby, BC, Canada; Computer, May 1995, pp. 40-49.
	C21	IEEE/IEE Electronic Library, "An Observation-Based Admission Control Algorithm For Multimedia Servers" Vin, H.M.; Goyal, A.; Goyal, A.; Goyal, P.; Dept. of Comput. Sci., Texas Univ., Austin, TX; International Conference on Multimedia Computing and Systems, 1994, May 15-19, 1994, pp. 234-243.
	C22	"Symmetrix Model 55XX Product Manual, P/N 200-810-550 Rev D" EMC Corporation, Hopkinton, Mass., May 1994, pp. 1-236.
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